Gamma Spectroscopy and Gamma-ray Intensity determination for ^{48}V

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The ^{48}V beta and electron capture decay was studied by gamma-ray spectroscopy. Targets of natural metallic Titanium, 99.99∼% purity, 0.6∼mm thick, were irradiated in the IPEN/CNEN-SP Cyclotron Accelerator with 24∼MeV protons, degraded to 17∼MeV with a thin Al foil, and 2μA current. The ^{48}V was obtained by the ^{48}Ti(p,n) reaction along with ^{44}Sc, ^{46}Sc, ^{47}Sc, ^{48}Sc concurrent products. It was also observed ^{56}Co from impurities. The waiting time from the end of the irradiation to the beginning of the gamma-ray measurement was one week to allow for the ^{48}Sc, 44∼h, decay. The energy and relative efficiency calibrations were performed with a ^{56}Co source produced in the Cyclotron accelerator through the ^{56}Fe(p,n) reaction using a natural iron target similar in shape to the Titanium one. The gamma-ray spectroscopy system used a 35% efficiency HPGe detector, 1.85∼keV nominal resolution for 1.33 MeV ^{60}Co photons. The energies, in keV, and intensities, in photons per parent decay, of the observed gamma-rays are: 802.85(4) - 0.00136(12), 928.34(6) - 0.007871(25), 944.135(12) - 0.07871(5), 983.526(5) - 0.99993(23), 1312.115(5) - 0.98215(14), 1437.529(15) - 0.001196(7), 2240.396(16) - 0.23328(17), 2375.20(4) - 0.000087(4), 2420.93(4) - 0.000067(4), where the uncertainties are given between parentheses in units of the least significant digit. In many cases, these energies and intensities are an order of magnitude more accurate than previously known. Two lines formerly assigned to the ^{48}V decay, at 938 and 1063 keV, were not observed; their intensities upper limits determined in this experiment were $< 10^{-5}$, and $< 5.10^{-5}$ photons per parent decay, respectively.

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